The iPad in portable imaging: radiology on the move

The iPad (Apple Inc) was approved by the Food and Drug Administration in 2008 in the United States as a mobile image viewing device, and is being used by clinicians to varying degrees across institutions in the UK (Wodajo, 2011). However, it is currently intended for the display of images when there is no preferable alternative, not as a primary diagnostic tool.

Clinical uses

In allowing greater freedom of location, a mobile device such as the iPad confers clear advantages to a radiologist on the go. One such scenario would be a radiologist seeking a second opinion on a scan from a colleague who is offsite. During on-call duties, the iPad would allow a consultant to review images reported by his/her junior colleagues outside the radiology department. Other applications would include multidisciplinary team meetings, teaching sessions, and in clinical settings where clinicians would be able to sit side by side with patients and explain the imaging findings.

As a viewing device, the vital statistics of the iPad 2 compare favourably with other portable media platforms: it has a 1024 x 768 pixel screen resolution (132 pixels per inch) (Friedman, 2010) and maximal luminance of 270 cd/m^2 (which surpasses the requisite 171 cd/m^2 recommended by the American College of Radiology in the only published guideline (American College of Radiology, 2007). In comparison, the average primary interpretation display used in radiology departments has a maximal luminance of 500–600 cd/m^2.

The recently released iPad 3 uses elevated pixel technology to feature a Retina display of 2048 x 1536 resolution, 44% greater colour saturation than the iPad 2 and 3.1 million pixels, with therefore four times the number of pixels compared to the iPad 2 in the same 9.7-inch space, and a million more than an HDTV, while weighing 680 g. The 9.7-inch screen of the iPad negates the need for panning and zooming of images required on the iPhone, which has previously been approved by the US Food and Drugs Administration as a viewing platform. The iPad also overcomes previous limitations of the iPhone, such as slower download speed and small screen size.

These specifications have enabled the iPad to gain approval by the US Food and Drugs Administration, with software such as OsiriX or Mobile MIM, for viewing of computed tomography, magnetic resonance imaging, positron emission tomography and single positron emission computed tomography images. While these modalities lend themselves to iPad assessment the screen resolution is less suited to accurate assessment of higher resolution plain radiographs (typically 2000 x 2500 pixels) (Siegal and Kolodner, 2006).

Following the release of the original iPad in May 2008, several alternative tablet devices have been released onto the market, which include the BlackBerry PlayBook (7-inch screen, 1200 x 600 pixel resolution, 425 g weight) and Samsung Galaxy Tab 10.1 (10.1-inch panel, 1280 x 800 pixel resolution display, 565 g weight), but the iPad continues to be the 'post personal computer' market leader.

Is it good enough?

Several small studies have investigated the adequacy of the iPad as a diagnostic viewing device. In one such study, undertaken at Imperial College Healthcare Trust, 10 consultant radiologists read the same number of emergency computed tomography studies of various body parts, first on the iPad using the OsiriX HD image viewing software and subsequently on standard computed tomography workstations. This revealed comparable error rates on both platforms, although of note was an unacceptable major error rate of 27% for computed tomography pulmonary angiography studies on the iPad (Fascia et al, 2010).

A further study based in Massachusetts General Hospital compared pneumothorax detection rates by a chest radiologist assessing 20 plain radiographs, first on an iPad and then on PACS (picture archive communication system) workstations 1 week later. This also found a high level of concordance, differing only in one case (Gupta et al, 2010).

Possible problems

So why not give up the departmental radiology displays altogether? The touchscreen nature of the iPad means that it is not necessarily kept clean, unlike the fixed screen in a radiology department. The ambient lighting is not under strict control with a mobile viewing device, which can affect image quality and interpretation. A further potential area of abuse could be reviewing images that have been snapped as poor quality photos rather than properly uploaded.

Security also remains an issue, although the iPad is a class leader in this respect having hardware advanced encryption standard and virtual private network built in. Patient health information should not be stored on the device itself, but should be accessed securely by a passcode authenticated and encrypted webserver. Short lockout times are a must. Worrying reports of iPad security bypass hacks have surfaced on the internet, such as the smart cover trick, whereby the last viewed application can be re-opened by closing the smart cover and pressing cancel. This reminds us that the iPad is a consumer device, and not designed for protecting sensitive data.

As well as the IT logistics of setting the network up, trusts will need to consider the relatively high unit cost of these portable and relatively fragile devices, and the increased insurance premiums that they incur.

Moving forward

Despite these factors, the iPad should enhance working flexibility both in and outside the radiology department. It will not be a substitute for workstations in the radiology department but rather a useful adjunct in the correct setting. BJHM

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KEY POINTS

- Used in appropriate situations the iPad allows radiologists and clinicians greater freedom of location for reviewing imaging and other patient health information.
- While suitable for the review of computed tomography, magnetic resonance imaging, positron emission tomography and single positron emission computed tomography studies, the iPad should not be a substitute for the departmental workstation in primary image interpretation and viewing of plain radiography.
- Setting these portable viewing devices up in practice requires high security internal networks to be established within trusts.